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the production of new characteristics by over-feeding and the fixation of these characters. The time during which these experiments have been in progress has been divided into three periods. During the first period, which includes the time immediately following the starting of the culture, the form of the head varied very widely under the new food conditions, but it soon returned to the original form when original conditions were restored. In three to four months after the culture was started, the form of the head was more regular and there were fewer aberrant individuals. Young females returned more slowly to the original head form when changed to original environment. The third period began almost two years after the culture was started and it was found that the young no longer returned to the original helmet form when original conditions were restored. A larger helmet persisted, thus showing a tendency toward the fixation of a new helmet form.

All of these experiments are still in progress and a more extended report on the results is promised at some future date.

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SCIENTIFIC JOURNALS AND ARTICLES

The American Journal of Science for September contains the following articles: "Use of the Grating in Interferometry," by C. Barus; "Fox Hills Sandstone and Lance Formation ('Ceratops Beds') in South Dakota, North Dakota and Eastern Wyoming," by T. W. Stanton; "New Occurrence of Hydrogiobertite," by R. C. Wells; "New Occurrence of Plumbojarosite," by W. F. Hillebrand and F. E. Wright; "Heat of Formation of the Oxides of Cobalt and Nickel," and sixth paper on the "Heat of Combination of Acidic Oxides with Sodium Oxide," by W. G. Mixer; "Mosesite, a New Mercury Mineral from Terlingua, Texas," by F. A. Canfield, W. F. Hillebrand and W. T. Schaller; "Researches upon the Complexity of Tellurium," by W. R. Flint; "Gravimetric Estimation of Vanadium as Silver Vanadate," by P. E. Browning and H. E. Palmer; "Brachiopod Genus *Syringothyris*

in the Devonian of Missouri," by C. Schuchert; "George Frederic Barker."

SPECIAL ARTICLES

THE INFLUENCE OF EXTERNAL CONDITIONS UPON THE LIFE CYCLE OF HYDATINA SENTA

THE search for the factors which regulate the production of the parthenogenetic and the sexual phases in the life history of the rotifer, *Hydatina senta*, has been conducted for some time. Maupas concluded that temperature regulated these two phases, while Nussbaum found that the controlling factor was food. Punnett and the writer¹ were unable to confirm these results. Recently Shull² has claimed that the absence of certain chemicals in the culture water causes the sexual phase to be produced, while the presence of these chemicals prevents the appearance of the sexual phase. This suggestion is probably partially true, but it does not seem to express the whole truth, nor solve satisfactorily the whole problem.

During the past two years I have kept pedigree strains or families of these rotifers continually in the laboratory and have made some observations which may lead to a clearer understanding of the conditions which control the production of the sexual and parthenogenetic phases in the life cycle of this rotifer.

A general food culture for rotifers is usually made by adding about one hundred and fifty grams of fresh horse manure to about two thousand cubic centimeters of ordinary water and allowing this mixture to stand at room temperature after being inoculated with a miscellaneous lot of microorganisms. It is readily noticeable that in large jars of such newly made food cultures in which rotifers have been placed, that sexual females (females capable of producing either males from small parthenogenetic eggs or females from large fertilized eggs) appear quite abundantly for a few days or weeks, then gradually disappear and only parthenogenetic females remain in the cultures as they become older.

In June, 1909, several general cultures

¹ *Journ. Exp. Zool.*, Vol. 5, pp. 1-25.

² *Amer. Nat.*, Vol. 44, pp. 146-150.